C. WIRT.

PROCESS OF MAKING ELECTRIC HEATERS.

APPLICATION FILED DEC. 2, 1918.

1,376,987. Patented May 3, 1921.

Fig. 1

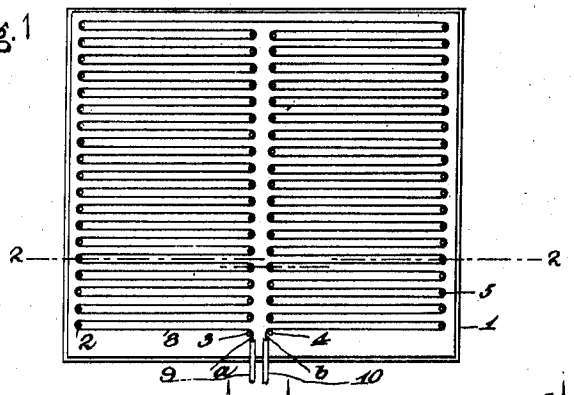


Fig. 2

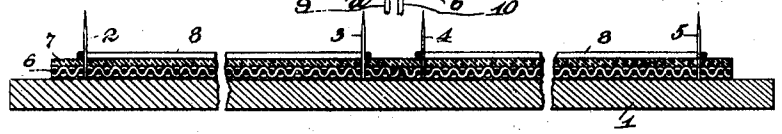


Fig. 3

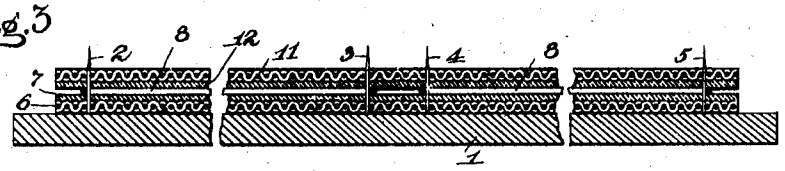


Fig. 4

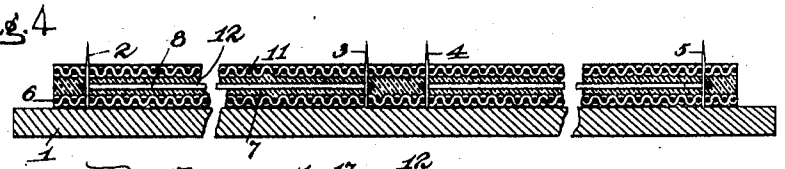


Fig. 5

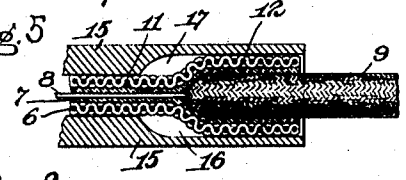
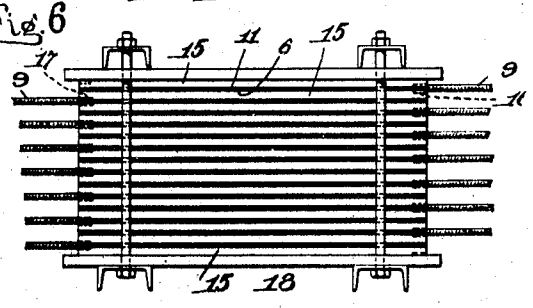


Fig. 6



Witnesses:

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PROCESS OF MAKING ELECTRIC HEATERS.

1,376,987. Specification of Letters Patent. Patented May 3, 1921.

Application filed December 2, 1918. Serial No. 264,914.

To all whom it may concern:

Be it known that I, CHARLES WIRT, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Process of Making Electric Heaters, of which the following is a specification.

The invention relates to devices wherein heat is produced by the passage of an electric current through a conductor having great resistance, the temperature of which will be raised by the passage of the current and radiated from the device. The invention is illustrated in connection with a flexible pad, but it will be understood that it may be employed in connection with clothing, blankets, and in other situations, whether the article from which the heat is to be radiated is flexible or not.

The objects of the invention are to produce an electric heater which will be simple in construction, cheap to manufacture, in which the conductor will be perfectly insulated, which will not easily get out of order, which will have a high resistance temperature coefficient, and which will automatically regulate the temperature.

These and further objects will more fully appear in the following specification and accompanying drawings, considered together or separately.

One embodiment of the invention is illustrated in the accompanying drawings, in which like parts in the several figures are designated by similar characters of reference, and in which—

Figure 1 is a diagrammatic plan view of the invention during one step in the process of making the same.

Fig. 2 is a section taken on the line 2—2 of Fig 1, but on a greatly enlarged scale.

Fig. 3 is a view similar to Fig. 2, showing another step in the process.

Fig. 4 is a similar view showing a further step.

Fig. 5 is a detail section taken at right angles to Fig. 4, during another step in the process; and

Fig. 6 is a side elevation illustrating the devices in position to undergo the final step in the process of making the same.

In carrying out the embodiment of the invention illustrated a base 1, carrying four series of pins 2, 3, 4, and 5, is employed. The pins are arranged in two groups. The pins 2 are staggered relatively to the pins 3 of that group, and the pins 4 and 5 of the other group are similarly staggered.

A sheet 6 of heavy textile fabric, such as canvas duck, to one surface of which a thin sheet 7 of unvulcanized rubber is attached, is applied to the base, with the rubber side uppermost, the pins piercing the fabric and rubber and retaining the sheet 6—7 in place.

A conductor 8, preferably of iron wire, of small diameter, is now laid upon the rubber surface in reflexed order The wire is laid by starting at the point *a*, bending it around the first pin of the series 3, then around the first pin of series 2, and so on to the last pin of series 2. The wire is then carried over to and around the last pin of series 5, to and around the last pin of series 4, and so on to the point *b* in proximity to the point *a*.

The wire is thus continuous from the point *a* to the point *b*, and is in grid-iron form. The convolutions of each group are separated by the thickness of the pins.

A flexible conductor 9 is now attached, by soldering or otherwise, to the extremity of the reflexed conductor at *a*, and a similar flexible cord 10 is similarly attached to the other extremity of the wire 8 at *b*. The conductors 9 and 10 are of the ordinary construction, and are insulated by means of a suitable flexible covering. The points of connection between the ends of the wire 8 and the cords 9 and 10 are within the boundaries of the sheet 6—7. The other ends of the members 9 and 10 are secured to a plug which may be inserted in the usual socket. The cords 9 and 10 may be of any length desired.

A sheet 11, of duck, to one surface of which a thin sheet of unvulcanized rubber 12 is attached, is now placed over the sheet 6—7 and forced downward, with its rubber surface in contact with the conductor 8, and with the pins 2, 3, 4, and 5 extending through the sheet 11—12, as shown in Fig. 3. This operation may be carried out in an ordinary letter-copying press. The sheet 11—12 is in the same size as the sheet 6—7.

Heat and pressure, as by means of an ordinary sad iron, are now applied to the upper, or fabric surface of the sheet 11—12. The heat will soften the rubber surfaces, the pressure will cause the conductor 8 to become embedded in the rubber, and the rubber surfaces of the sheets will be united to form a single sheet entirely surrounding the wire 8

and the inner ends of the cords 9 and 10, as shown in Fig. 4. The structure produced as above described is now stripped from the base by being pulled over the pins.

The pad is now laid flat upon a metal plate 15 provided with two grooves 16 extending into the face thereof from one side. These grooves correspond in position with the inner ends of the cords 9 and 10, and one side of the bulges produced in the sheets by the presence of the cords lies in the grooves. The opposite face of the plate has similar grooves 17 at corresponding points at the edge opposite the grooves 16.

Alternate layers of pads and plates are assembled with the pads disposed "heads and tails." The stack 18 thus produced has a plate 15 at top and bottom. The stack is now clamped together, as, for example, as shown in Fig. 7, is placed in an oven having the proper temperature, and the rubber is vulcanized. This operation will permanently secure the sheets 7 and 12 to the textile sheets 6 and 11 respectively, and will permanently unite the sheets 7 and 12 with the convolutions of the wire embedded in the sheet thus produced. When the vulcanizing has been completed, the stack is removed from the oven, the pads are separated from the plates 15, and when the free ends of the cords 9 and 10 are secured to the proper current carrying devices the heater is ready for use. The pad thus produced is thin, light in weight, and extremely flexible in character. The heat is evenly distributed over the entire surface and the uncovered conductor is embedded in an extremely flexible material having high electrical insulating qualities, but which is of high heat conductivity.

The conductor 8 is retained in the desired position solely by the insulating material, and as it is absolutely embedded in the material it, the conductor, cannot move in any direction, while at the same time the reflexions of the wire are in close proximity one to the other, whereby the maximum amount of wire may be employed within a given area.

It is to be understood that no attempt has been made to make the drawings to scale. In the embodiment of the invention illustrated the sheets 6—7 and 11—12, as shown in Fig. 1, are about 10 by 14 inches, and the pins of one row, 2 for example, number approximately one hundred and ten. The pins 3 and 4 are placed in line with the centers of the spaces between the pins 2 and 5 respectively, whereby the wire 8 will be so laid that each reflexed portion is separated from the next by a space corresponding to the diameter of a pin. The pins are of such small diameter that the holes made in the sheets 6—7 and 11—12 are unobjectionable.

It is to be further understood that the sheets 6 and 11 may be omitted, if desired, and that the device may be used without a covering for the rubber sheet in which the conductor is embedded.

If desired the pad in either of the forms described may be inclosed in a slip cover, which may be removed and laundried.

In accordance with the provisions of the patent statutes, I have described the principle of my invention, together with the apparatus which I now consider to represent the best embodiment of a device for carrying the invention into effect; but I desire to have it understood that the apparatus shown is merely illustrative, and that the invention may be carried out in other ways.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. The process of making electric heaters, which comprises applying a conductor to the surface of a body of insulating material, placing a second body of insulating material over the first sheet to cover the conductor, and uniting the bodies to embed the conductor.

2. The process of making electric heaters, which comprises applying a conductor in reflexed order to the surface of a sheet of unvulcanized rubber, placing a sheet of unvulcanized rubber over the first sheet with the conductor between the sheets, applying pressure to embed the conductor in the sheets, and securing the sheets together.

3. The process of making electric heaters, which comprises applying a conductor in reflexed order to the surface of a sheet of unvulcanized rubber, placing a sheet of unvulcanized rubber over the first sheet with the conductor between the sheets, applying pressure to embed the conductor in the sheets, and permanently securing the sheets together.

4. The process of making electric heaters, which comprises applying a conductor in reflexed order to the surface of a sheet of unvulcanized rubber, placing a sheet of unvulcanized rubber over the first sheet with the conductor between the sheets, applying heat and pressure to embed the conductor in the sheets, and permanently securing the sheets together.

5. The process of making electric heaters, which comprises applying a conductor in reflexed order to the surface of a sheet of unvulcanized rubber, placing a sheet of unvulcanized rubber over the first sheet with the conductor between the sheets, applying heat and pressure to emoed the conductor in the sheets, and permanently vulcanizing the sheets together.

6. The process of making electric heaters, which comprises coating a sheet of flexible material with a thin sheet of unvulcanized rubber, placing an iron wire of small di-

ameter on the surface of the rubber and in reflexed form, applying a second rubber coated flexible sheet with the rubber in contact with the wire, applying heat and pressure to soften the rubber and cause the wire to become embedded in the rubber, and vulcanizing the rubber.

7. The process of making electric heaters, which comprises securing a sheet of textile fabric having a thin coating of rubber on one side thereof to a base by means of pins which project through the sheet, laying an iron wire of small diameter on the rubber surface and around the pins as guides to give the wire a reflexed form, applying a second rubber coated textile sheet with its rubber surface in contact with the wire, said pins passing through the second sheet, applying heat and pressure to the exposed side of the second sheet, embedding the wire in the rubber and uniting the sheets, removing the structure thus produced from the base, placing the structure under pressure, and vulcanizing the rubber.

8. The process of making electric heaters, which comprises securing a sheet of textile fabric having a thin coating of rubber on one side thereof to a base by means of pins which project through the sheet, laying an iron wire of small diameter on the rubber surface and around the pins as guides to give the wire a reflexed form, securing a flexible conductor to each end of the wire, applying a second rubber coated textile sheet with its rubber surface in contact with the wire, said pins passing through the second sheet, applying heat and pressure to the exposed side of the second sheet, embedding the wire in the rubber and uniting the sheets, removing the structure thus produced from the base, placing the structure under pressure, and vulcanizing the rubber.

This specification signed and witnessed this 26th day of November, 1918.

CHARLES WIRT.

Witnesses:
ABRAHAM FASTORE,
A. E. RENTON.